

CLAIMS

1. Heating apparatus for a printing plate oven comprising at least one heating element extending in a first direction wherein a printing plate is arranged, in use, to pass the heating element in a second direction which is at an angle to the first direction.
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2. Apparatus according to claim 1 in which the heating element comprises a substantially linear heating element.
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3. Apparatus according to claim 2 in which the linear heating element comprises a longitudinal axis which extends in the first direction.
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4. Apparatus according to any preceding claim in which the printing plate is arranged, in use, to pass underneath the or each heating element.
- 20 5. Apparatus according to any preceding claim in which the heating apparatus comprises a plurality of heating elements.
6. Apparatus according to claim 5 in which each heating element comprises a longitudinal axis which extends in the first direction.
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7. Apparatus according to any preceding claim in which the or each heating element comprises a lamp.
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8. Apparatus according to claim 7 in which the or each heating element comprises an infra-red lamp.

9. Apparatus according to claim 7 or claim 8 in which the or each lamp comprises a halogen lamp.
10. Apparatus according to any one of claims 7 to 9 in 5 which the or each lamp is pulsated in order to control the heat generated by the respective lamp.
11. Apparatus according to any preceding claim in which the angle between the first direction and the second 10 direction is less than or equal to substantially 70°.
12. Apparatus according to any preceding claim in which the heating elements are arranged spaced apart laterally across the heating apparatus.
- 15 13. Apparatus according to any preceding claim wherein, if a part of a printing plate passes underneath a first end of a first heating element then said part of the printing plate passes underneath a second end of a second 20 (adjacent) heating element.
14. Apparatus according to any preceding claim in which the or each heating element comprises a first end which is located upstream of second end of the respective heating 25 element such that a printing plate is arranged, in use, to pass underneath the first end of the heating element and subsequently underneath the second end of the heating element.
- 30 15. Apparatus according to any preceding claim in which the heating apparatus comprises a first group of heating elements located centrally laterally in the heating apparatus and one right group and one left group of

heating elements located adjacent to the lateral edges of the heating apparatus.

16. Apparatus according to any preceding claim in which
5 the or each heating element comprises reflecting means.

17. Apparatus according to claim 16 in which the or each reflecting means is located above the respective heating element.

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18. Apparatus according to claim 16 or claim 17 in which the reflecting means comprises a first side wall and a second side wall in order to direct the heat.

15 19. Apparatus according to any one of claims 16 to 18 in which the reflecting means maintains and reflects the heat radially out from the respective heating element within an angle and wherein the angle is substantially 80°.

20 20. Apparatus according to any one of claims 16 to 19 in which the reflecting means reflects the heat downwardly towards an upper surface of a printing plate, in use.

21. Apparatus according to any preceding claim in which
25 the heating apparatus comprises an array of heating elements wherein the longitudinal axes of the heating elements are parallel.

22. Apparatus according to claim 21 in which the heating
30 elements form a herring bone pattern within the heating apparatus.

23. Apparatus according to any preceding claim in which the heating apparatus comprises cooling means.

24. Apparatus according to claim 23 in which the cooling means is arranged, in use, to cool the or each heating element.

25. Apparatus according to any one of claim 16 to claim 20 or any one of claim 21 to 23 when dependent upon any one of claim 16 to claim 20 in which the reflecting means is arranged such that the heat reflected from a first heating element overlaps on a surface of a printing plate, in use, with the heat reflected from an adjacent heating element.

26. A method of heating printing plates in an oven compartment of a printing plate oven comprising heating at least one heating element wherein the heating element extends in a first direction and moving a printing plate passed the heating element in a second direction which is at an angle to the first direction.

27. A method according to claim 26 in which the method comprises passing the printing plate underneath the heating element.

28. A method according to claim 26 or claim 27 in which the method comprises providing a plurality of heating elements in the heating apparatus.

29. A method according to any one of claim 26 to claim 28 in which the method comprises providing an array of heating elements in a herring bone pattern in the heating apparatus.

30. Drive means for a printing plate, the drive means being arranged, in use, to drive a printing plate wherein the drive means comprises a first roller and the first 5 roller comprises an outer surface for contacting the printing plate in which the outer surface of the roller comprises at least one raised portion.
31. Drive means according to claim 30 in which the drive 10 means is for use in a printing plate oven.
32. Drive means according to claim 30 or claim 31 in which the first roller comprises a drive roller which is driven.
- 15 33. Drive means according to any one of claim 30 to claim 32 in which the outer surface of the first roller comprises a plurality of raised portions.
- 20 34. Drive means according to any one of claim 30 to claim 33 in which the or each raised portion extends radially around the outer surface of the first roller.
- 25 35. Drive means according to claim 34 in which the or each raised portion extends completely radially around the outer surface of the first roller to provide a cylindrical support surface.
- 30 36. Drive means according to any one of claim 30 to claim 35 in which the drive means comprises urging means to urge the printing plate towards the first roller, in use.
37. Drive means according to claim 36 in which the urging means comprises a second roller.

38. Drive means according to claim 37 in which the outer surface of the second roller is spaced from the outer surface of the first roller by a distance slightly less than the thickness of a printing plate to be driven therethrough.

39. Drive means according to claim 37 or claim 38 in which the second roller is biased relatively towards the first roller.

40. Drive means according to any one of claim 30 to claim 39 in which the outer surface of the first roller comprises a deformable or resilient material.

15 41. Drive means according to any one of claims 30 to claim 40 in which the urging means comprises a second roller wherein the outer surface of the second roller comprises at least one raised portion.

20 42. Drive means according to claim 41 in which the or each raised portion on the second roller extends radially around the outer surface of the second roller.

25 43. Drive means according to claim 41 or claim 42 in which the second roller has an outer surface contoured or shaped identical to the first roller.

44. Drive means according to claim 43 in which the raised portions of the second roller are off set longitudinally along the urging roller in order for a raised portion in one roller to locate within a channel portion defined between two adjacent raised portions on the other roller.

45. Drive means according to any one of claims 30 to 44 in which adjacent raised portions on the or each roller define a channel portion therebetween.

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46. Drive means according to any one of claim 36 or any one of claims 37 to 45 when dependent upon claim 36 in which the first roller has raised portions which are offset laterally with raised portions of the urging means.

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47. Drive means according to claim 46 in which the raised portions are offset such that a part of a printing plate is not contacted simultaneously on both surfaces.

15 48. A method of driving a printing plate, the method comprising driving a roller to drive the printing plate wherein the roller comprises an outer surface for contacting the printing plate in which the outer surface of the roller comprises at least one raised portion.

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49. A method according to claim 48 in which the method comprises urging the printing plate into contact with the outer surface of the roller.

25 50. A method according to claim 48 or claim 49 in which the method comprises passing the printing plate between two rollers wherein one of the roller is driven.

30 51. Cooling means for use with a printing plate oven wherein the cooling means comprise deflection means in order to flex a part of a printing plate during cooling.

52. Cooling means according to claim 51 in which the cooling means applies a tensile force to a printing plate during cooling.

5 53. Cooling means according to claim 51 or claim 52 in which the deflection means comprises a deflection member.

54. Cooling means according to any one of claim 51 to claim 53 in which the deflection means comprises guide
10 means.

55. Cooling means according to claim 54 in which the guide means guides the printing plate in a first direction and is arranged to guide the printing plate in order to abut
15 the deflection member which flexes and deflects the printing plate in order for the printing plate to travel in a second direction.

56. Cooling means according to any one of claims 51 to 55
20 in which the deflection means comprises a deflecting roller.

57. Cooling means according to claim 56 in which the printing plate is arranged to pass between a first guide
25 member around around an arcuate part of an outer surface of the deflecting roller and to a second guide member.

58. Cooling means according to claim 57 in which the first guide member is spaced from the second guide member by a
30 distance less than the longitudinal length of the printing plate.

59. Cooling means according to any one of claims 51 to 58 in which the printing plate is flexed laterally across the width thereof during cooling.

5 60. Cooling means according to claim 56 or any one of claim 57 to claim 59 when dependent upon claim 56 in which the deflecting roller comprises a driven deflecting roller.

10 61. A method of cooling a printing plate comprising flexing at least a part of the printing plate during cooling.

15 62. A method according to claim 61 in which the method comprises tensing at least a part of the printing plate during cooling.

20 63. A method according to claim 61 or claim 62 in which the method comprises flexing the printing plate over a lateral direction.

64. Heating apparatus for a printing plate oven comprising heating apparatus and control means wherein the control means is arranged, in use, to control the heat of the 25 heating apparatus relative to a part of a printing plate passing therethrough.

30 65. Heating apparatus according to claim 64 in which the part comprises a section which may be defined on the printing plate due to the location of the part relative to its longitudinal and/or lateral position on the printing plate.

66. Heating apparatus according to claim 64 or claim 65 in which the control means is arranged, in use, to control the heat of the heating apparatus relative to the longitudinal position of the printing plate which is
5 located in the heating apparatus.

67. Heating apparatus according to any one of claim 64 to claim 66 in which the heating apparatus is arranged to simultaneously provide a first temperature to one part of
10 the printing plate and a second temperature to another part of the printing plate.

68. Heating apparatus according to claim 67 in which the heating apparatus is arranged to simultaneously provide a
15 third temperature to a third part of the printing plate.

69. Heating apparatus according to any one of claim 64 to claim 68 in which the control means controls the heat of the heating apparatus in a first period which is an entry
20 period.

70. Heating apparatus according to claim 69 in which the control means controls the heat of the heating apparatus in a second period which is an exit period.
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71. Heating apparatus according to claim 70 in which the control means controls the heat of the heating apparatus in a third period which is an intermediary period between the entry period and the exit period.
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72. Heating apparatus according to any one of claim 64 to claim 71 in which the control means is arranged to control the heat of the heating apparatus in a plurality of

periods or sections whilst the printing plate is passing through the heating apparatus.

73. Heating apparatus according to any one of claim 64 to
5 claim 72 in which the control means controls the heat supplied by a plurality of heating elements in the heating apparatus.

74. Heating apparatus according to any one of claim 64 to
10 claim 73 in which the control means is arranged to supply heat to a printing plate such that the printing plate is defined in a plurality of zones wherein each zone is arranged to be supplied with a different amount of heat.

15 75. Heating apparatus according to claim 74 in which the printing plate is divided into a plurality of lateral sections such that the heat supplied to outermost side sections is greater than that applied to the other sections located between the outermost side sections.

20 76. Heating apparatus according to any one of claims 64 to claim 75 in which the printing plate is divided such that an intermediary section locates between a front section and a rear section.

25 77. Heating apparatus according to claim 76 in which the heat applied to the intermediary section is less than that applied to the front section but is greater than that applied to the rear section.

30 78. A method of controlling heating apparatus of a printing plate oven comprising controlling the heat applied to the printing plate and varying the heat

relative to a part of a printing plate passing through heating apparatus.

79. A method according to claim 78 in which the method
5 comprises varying the heat laterally across the heating apparatus.

80. A method according to claim 78 or claim 79 in which the method comprises varying the heat as a printing plate
10 passes therethrough in order to heat the printing plate dependent upon the longitudinal location of the printing plate in the heating apparatus.

81. Ambient temperature regulation means for a printing
15 plate oven comprising sensor means wherein the sensor means is arranged to sense the ambient temperature within an oven compartment of the printing plate oven and to cool the oven compartment of the printing plate oven when a predetermined ambient temperature is reached.

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82. Ambient temperature regulation means according to claim 81 in which the ambient temperature regulation means comprises exhaust means.

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83. Ambient temperature regulation means according to claim 82 in which the exhaust means comprises a plurality of exhaust ports.

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84. Ambient temperature regulation means according to claim 83 in which the exhaust ports are operable in order to enable fluid communication between the oven compartment and an external atmosphere.

85. Ambient temperature regulation means according to claim 83 or claim 84 in which the exhaust port(s), once opened, is arranged, to be closed when a predetermined ambient temperature has been reached.

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86. Ambient temperature regulation means according to any one of claim 83 to claim 85 in which the temperature regulation means is arranged to maintain the ambient temperature of the oven compartment within a predetermined range or below a set temperature relative to a selected ambient temperature.

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87. A method of regulating the ambient temperature in an oven compartment of a printing plate oven comprising sensing the ambient temperature within the printing plate oven and cooling the ambient temperature when a predetermined temperature is sensed by the sensing means.

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88. A method according to claim 87 in which the method comprises exhausting part of the air of the oven section.

89. Heating apparatus for a printing plate oven substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

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90. A method of heating printing plates substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

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91. Drive means for a printing plate substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

92. A method of driving a printing plate substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

5 94. A method of cooling a printing plate substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

10 95. Heating apparatus for a printing plate oven comprising heating apparatus and control means substantially as herein described with reference to, and as shown in any of the accompanying drawings.

15 96. A method of controlling heating apparatus of a printing plate oven substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

20 97. Ambient temperature regulation means for a printing plate oven substantially as herein described with reference to, and as shown in, any of the accompanying drawings.

25 98. A method of regulating the ambient temperature in an oven compartment of a printing plate oven substantially as herein described with reference to, and as shown in, any of the accompanying drawings.